

China's lighting energy consumption and the potential impact of its new ballast energy efficiency standard

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Environmental Energy Technologies

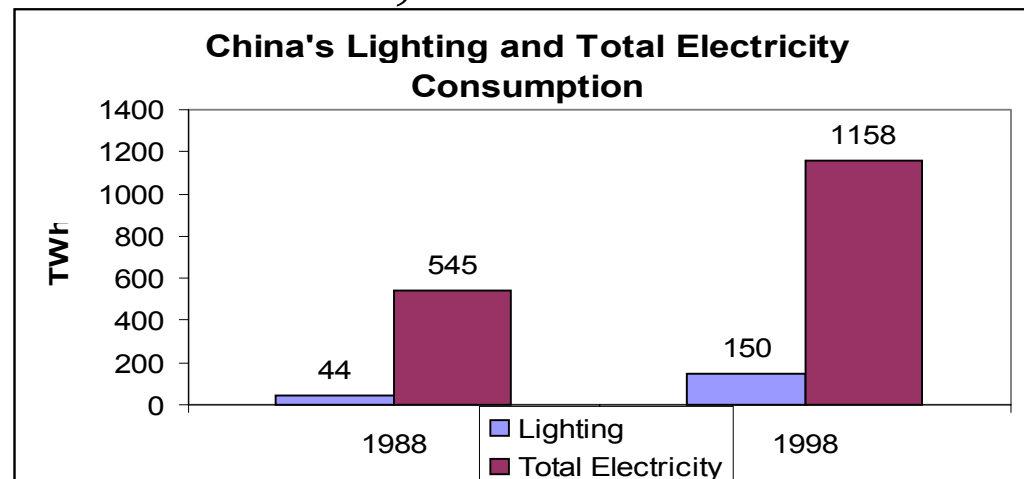


Summary

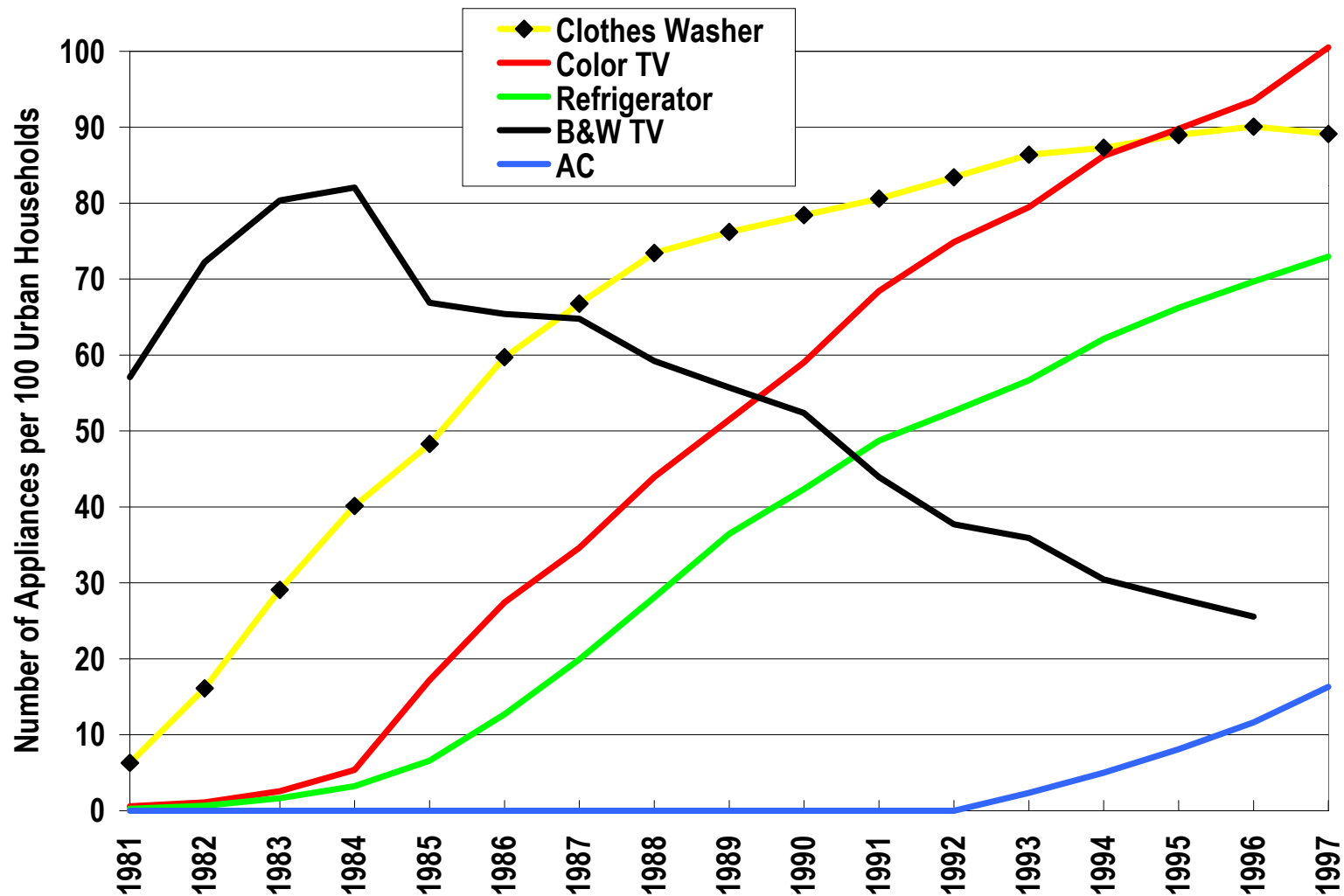
- Rapid economic growth and rising standard of living led to massive expansion of generating capacity
- Lighting energy consumption is one of the fastest growing end uses
- Fluorescent lighting market in China
- Efficiency standards and labels
- Ballast efficiency
- Impact of Ballast efficiency standard

China's lighting energy consumption

- Rapid economic growth over the past two decades has generated enormous demand grows for electricity
- Installed capacity reached 100 GW in 1987, 200 GW in 1995, and 300 GW in 2000



Consumption growing most rapidly in residential sector



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China's lighting market

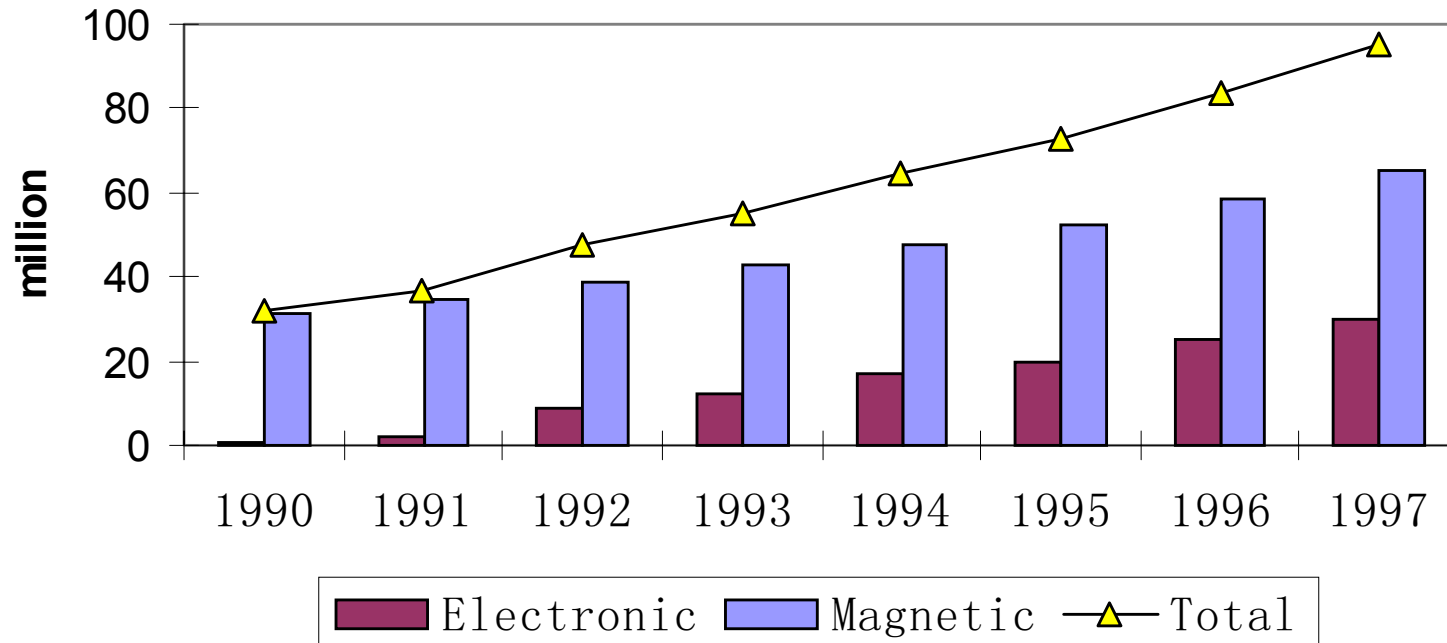
- Fluorescent lighting accounts for roughly one-third of China's lighting energy consumption
- In 1997, the production of tubular fluorescent lamps reached 400 million units,
- Among which, T12 lamps dominate the market ($> 80\%$), however, T8 lamps are growing fast, and T5 lamps start to test the market

China's lighting market

- Magnetic ballasts still dominate the market, but electronic ballasts are growing fast.
- In 1997, the production of linear fluorescent ballasts reached 95 million units, among which 65 million are magnetic, and 30 million are electronic
- electronic ballasts has grown from than 0.5 million in 1990 to 30 million 1997

China's lighting market

Figure 12: Annual production of fluorescent lamp ballasts in China



China's lighting market

- China is probably the largest producer of CFLs, with annual production of CFLs exceeds 100 million in the last few years,
- Over 1000 CFL manufacturers, no leading brand
- Market fragmentation by geographic regions

Barriers to efficient lighting products

- Cost
 - Most efficient products cost more than the traditional product they replaced
- Reliability
 - Many newer and more efficient products suffer serious quality and reliability problems
- Lack of standards
- Lack of information to facilitate consumer choice

Recent activities to overcome barriers

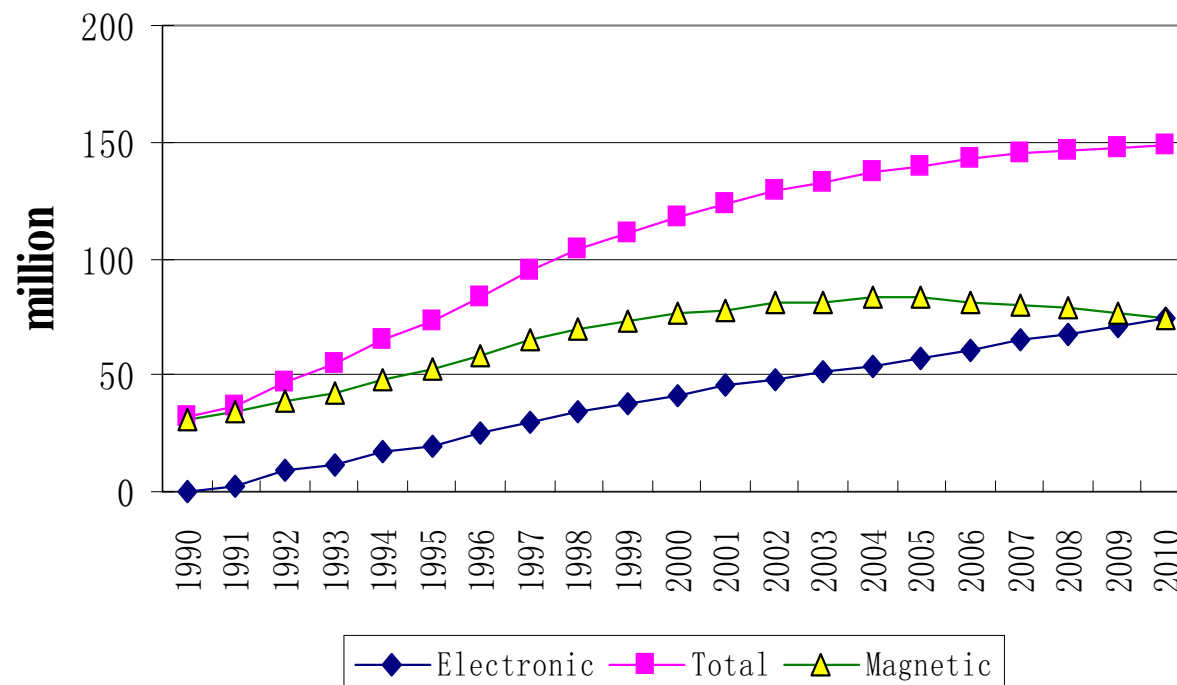
- GEF/ China Green Lights Project
 - Market transformation activities
- China Energy Conservation Product Certification Program
 - Endorsement label for high quality products
- Minimum efficiency standard imposed on ballasts, and work in progress for standard on fluorescent lamps

China's accomplishments in minimum energy efficiency standards

- China has taken the lead in developing minimum efficiency standards, covering 8 appliance products since 1989
 - *Refrigerators, air conditioners, washing machines, electrical iron, rice cookers, TVs, radios and recorders, and electric fans*
- Since 1995, China has, with LBNL assistance, initiated a more rigorous round of standard revision and development, including *fluorescent ballast and lamps, refrigerators, and room air-conditioners*

Fluorescent ballasts

Annual production of fluorescent ballasts in China



Products impacted by MEPS

magnetic ballasts	electronic ballasts
40W	40W
36W	36W
32W	32W
30W	30W
22W	22W
20W	20W
18W	18W

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Ballast efficiency measurement

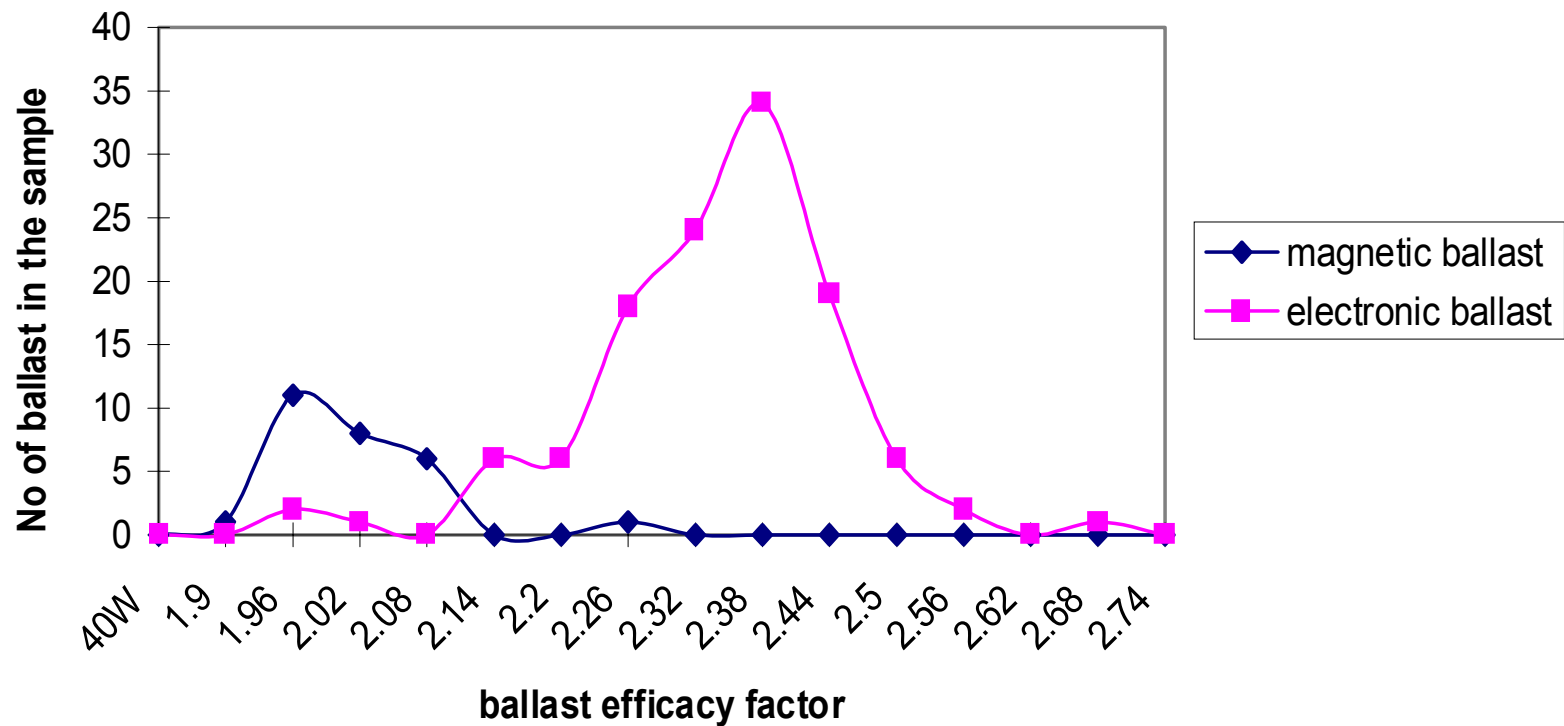
Ballast efficacy factor,

$$\text{BEF} = 100 \times \mu / P \quad (1)$$

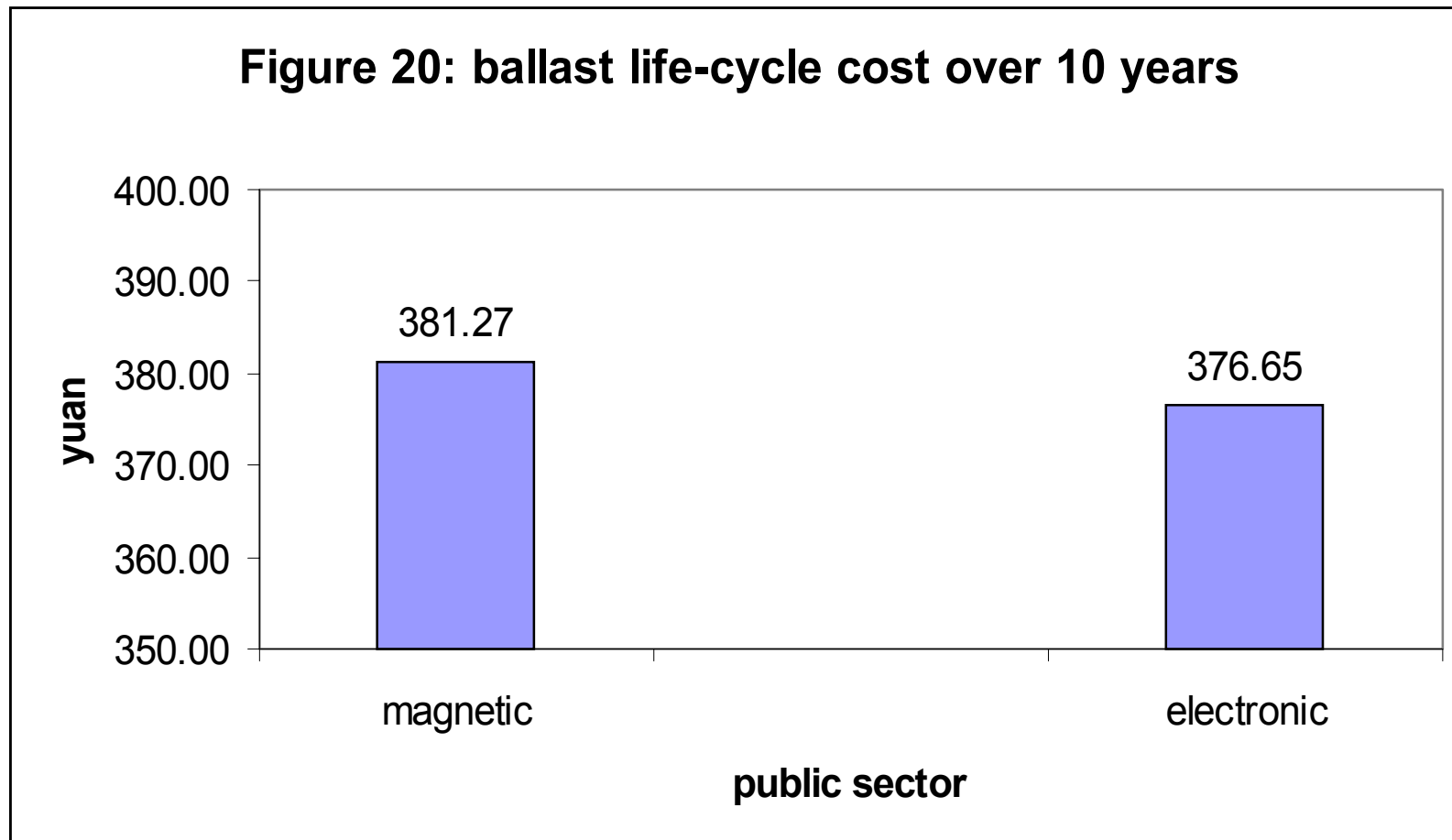
where μ is ballasts factor, P line input watts.

Ballast efficiency distributions

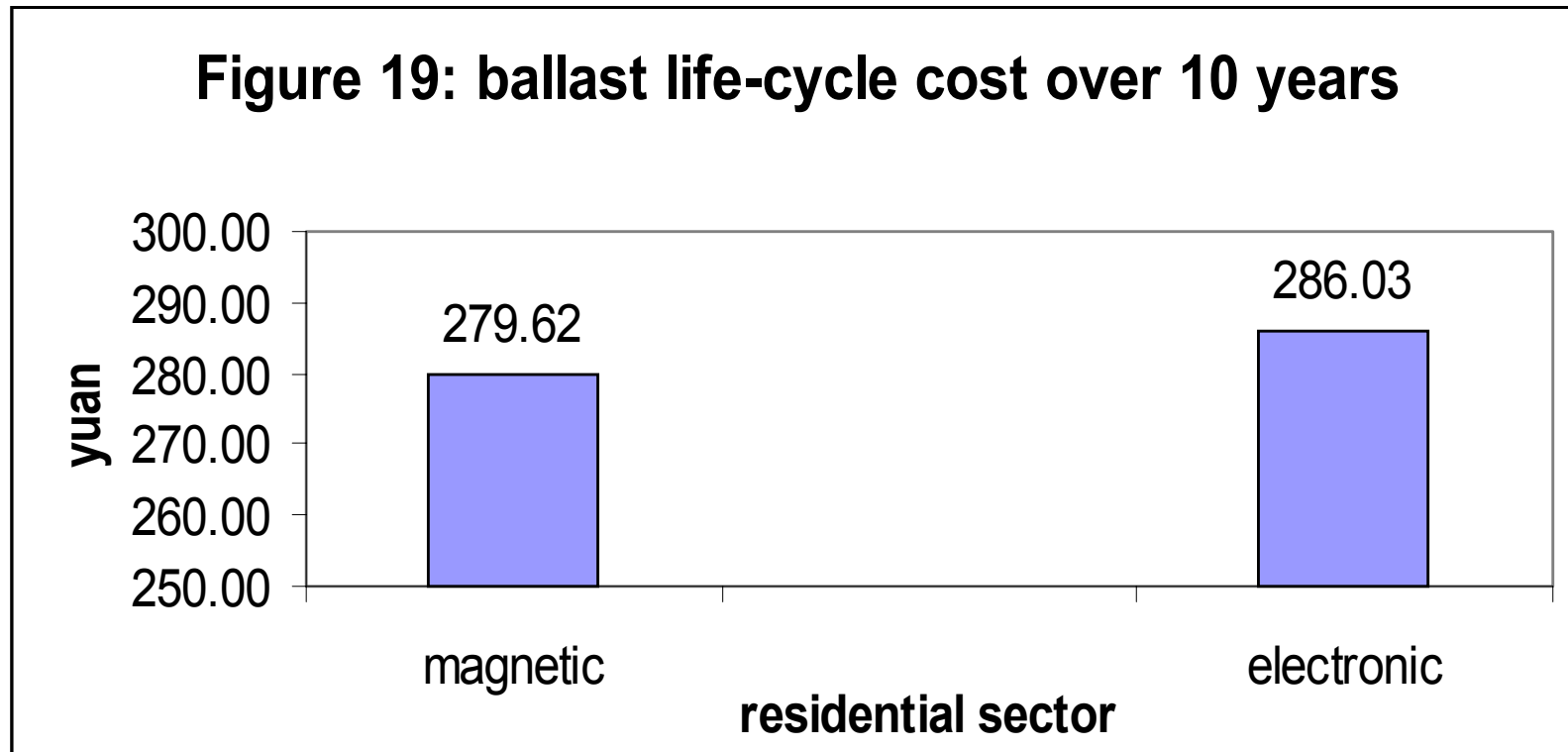
Figure 2: Distribution of ballast efficacy factors, 40W



Lifecycle cost analysis



Lifecycle cost analysis

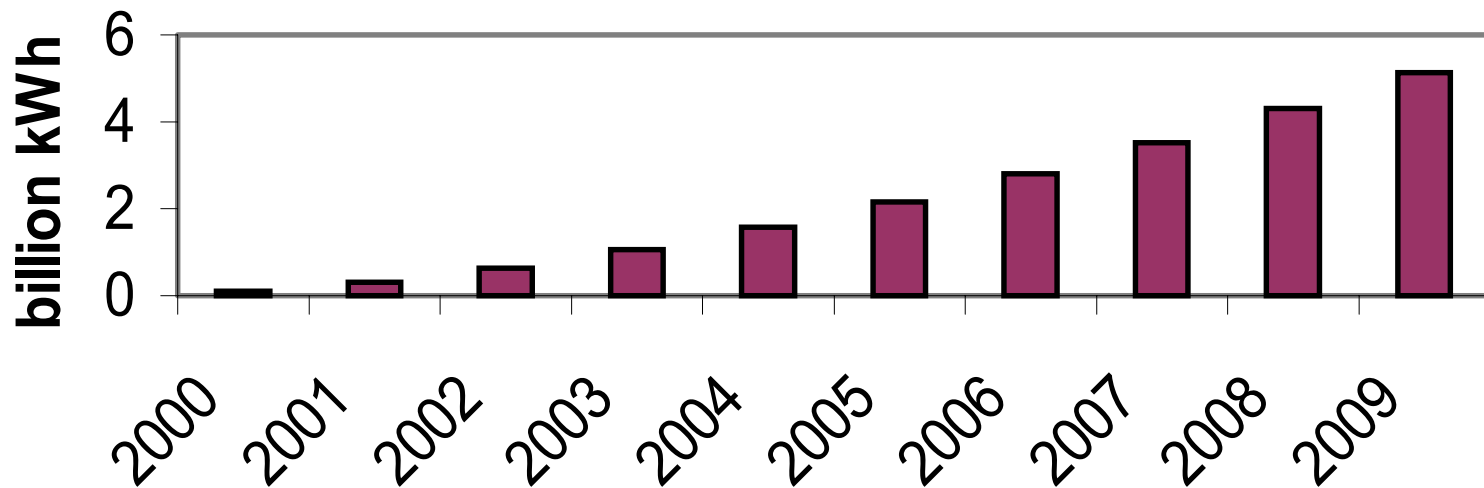


Minimum Efficiency for FL ballasts in China

Type	18W	20W	22W	30W	32W	36W	40W
Magnetic	3.154	2.95	2.770	2.232	2.146	2.030	1.992
Electronic	4.778	4.370	3.998	2.870	2.678	2.402	2.270

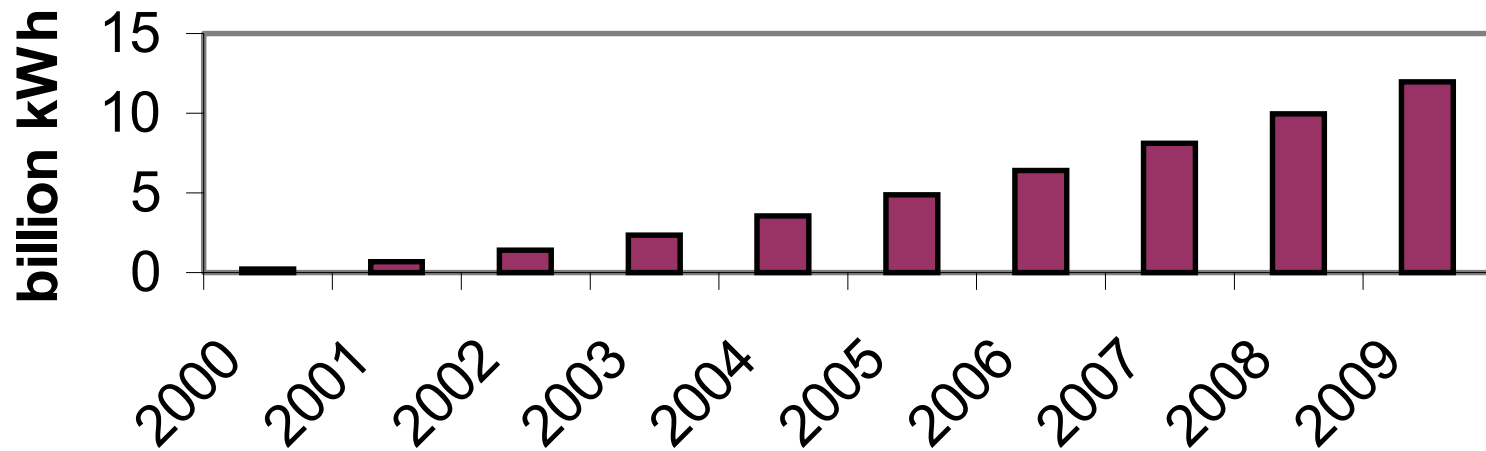
Standard Impact

Figure 5: Energy Savings under the minimum impact case



Standard Impact

Figure 6: Energy savings under the efficiency impact case



Standards impact

- Over the next decade, the implementation of the ballast efficiency standard alone would
 - reduce China's lighting energy use by 5 billion kWh
 - Save 2.8 billion yuan in electricity cost
 - Cut CO₂ emissions by 1.4 million tons of carbon

Available at

eetd.lbl.gov/EA/partnership/China